

## CLAIMS

What is claimed is:

- 1    1.    An assembly for conducting an electronic signal, the assembly comprising:  
2            a substrate having distinct first and second regions to enable connection to first and second  
3            circuit boards, respectively, the first and second regions including respective first and  
4            second through-holes formed in the substrate; and  
5            a first electronic cable disposed within the first through-hole and extending out of the first  
6            through hole, adjacent the substrate and into the second through-hole.
- 1    2.    The assembly of claim 1 wherein the first electronic cable comprises first and second ends  
2            disposed in the first and second through-holes, respectively.
- 1    3.    The assembly of claim 2 further comprising a first conductive plating disposed about an  
2            interior surface of the substrate that defines the first through-hole and a second conductive  
3            plating disposed about an interior surface of the substrate that defines the second through-  
4            hole, and wherein the first electronic cable includes a first conductor having a first end  
5            disposed in electrical contact with the first conductive plating and a second end disposed in  
6            electrical contact with the second conductive plating.
- 1    4.    The assembly of claim 3 wherein the first conductor is soldered to the first conductive  
2            plating.
- 1    5.    The assembly of claim 3 wherein the first through-hole is filled with conductive material.
- 1    6.    The assembly of claim 3 wherein the first through-hole is adapted to receive a conductive

2 pin that extends from a circuit board connector of the first circuit board.

1 7. The assembly of claim 3 further comprising a conductive pin secured within the first  
2 through-hole and projecting out of the first through-hole to enable connection with a  
3 female connector of the first circuit board.

1 8. The assembly of claim 7 wherein the first and second-through holes extend between first  
2 and second parallel surfaces of the substrate, the conductive pin projecting out of the first  
3 through-hole at the first surface, and the first end of the electronic cable entering the first-  
4 through hole at the second surface.

1 9. The assembly of claim 1 wherein the electronic cable comprises a coaxial cable having a  
2 center conductor and having an outer conductor disposed concentrically about the center  
3 conductor.

1 10. The assembly of claim 1 wherein the first electronic cable comprises:  
2 a pair of wires that extend parallel to one another along the length of the first electronic  
3 cable;  
4 an insulating material disposed about the pair of wires; and  
5 a conductive shield disposed about the insulator.

1 11. The assembly of claim 1 wherein the first electronic cable comprises a twisted pair of  
2 insulated wires.

1 12. The assembly of claim 2 wherein the first and second regions each include a plurality of  
2 other through-holes, and wherein the assembly further comprises a plurality of other

3 electronic cables extending from the first region to the second region, each of the plurality  
4 of other electronic cables having a first end disposed in a respective one of the other  
5 through-holes in the first region and a second end disposed in a respective one of the other  
6 through-holes in the second region.

1 13. The assembly of claim 11 wherein each of the plurality of other electronic cables comprises  
2 a coaxial cable.

1 14. The assembly of claim 11 wherein each of the plurality of other electronic cables comprises  
2 a pair of wires disposed within an insulator and a shield disposed about the insulator.

1 15. The assembly of claim 11 wherein each of the plurality of other electronic cables comprises  
2 a twisted pair of insulated wires.

1 16. The assembly of claim 1 wherein the first and second regions are disposed on a first planar  
2 surface of the substrate, and wherein the first electronic cable includes a first conductor that  
3 extends through the first through-hole to the first planar surface of the substrate.

1 17. The assembly of claim 16 wherein the first conductor comprises a first end disposed  
2 parallel to the first planar surface to receive a mating contact that extends from a circuit  
3 board connector of the first circuit board.

1 18. The assembly of claim 17 wherein the first conductor extends through the second through-  
2 hole and comprises a second end disposed parallel to the first planar surface to receive a  
3 mating contact that extends from a circuit board connector of the second circuit board.

- 1 19. The assembly of claim 17 wherein the first electronic cable further includes a second  
2 conductor that extends through the first through-hole to the first planar surface of the  
3 substrate, the second conductor having a second end disposed parallel to the first flat end.
- 1 20. The assembly of claim 17 wherein the first end is disposed substantially flush with the first  
2 planar surface.
- 1 21. The assembly of claim 17 wherein the first end has a substantially flat surface that is  
2 perpendicular to an axis of extension of the first conductor.
- 1 22. The assembly of claim 17 further comprising a dielectric disposed over the first end of the  
2 first conductor to establish a capacitive coupling between the first conductor and the  
3 mating contact that extends from the circuit board connector.
- 1 23. The assembly of claim 22 wherein the dielectric has a thickness and dielectric constant  
2 selected to achieve a desired capacitance between the first conductor and the mating  
3 contact that extends from the circuit board connector.
- 1 24. The assembly of claim 1 wherein the first and second regions are disposed on a first planar  
2 surface of the substrate, and wherein the first electronic cable includes a first conductor that  
3 extends within the first through-hole to a selected depth relative to the first planar surface.
- 1 25. The assembly of claim 1 wherein the first and second regions are disposed on a first planar  
2 surface of the substrate, and wherein the first electronic cable includes a first conductor that

3 extends within the first through-hole and has a substantially flat end recessed relative to the  
4 first planar surface to receive a mating contact that extends into the first through-hole.

1 26. The assembly of claim 1 wherein the first and second regions are disposed on a first planar  
2 surface of the substrate, and wherein the first electronic cable includes a first conductor that  
3 extends through the first through-hole and projects out of the first through-hole at a first  
4 end, the first end being substantially flat end to receive a mating contact of a circuit board  
5 connector of the first circuit board.

1 27. The assembly of claim 1 wherein the substrate has conductive traces disposed thereon.

1 28. The assembly of claim 27 wherein the substrate comprises a plurality of layers including a  
2 first layer having an interior surface disposed in contact with an interior surface of another  
3 of the layers, and wherein at least a portion of the plurality of conductive traces are  
4 disposed on the interior surface of the first layer.

1 29. The assembly of claim 1 wherein the substrate comprises first, second and third component  
2 substrates, the first component substrate having first and second openings that define the  
3 first and second regions, respectively, and the second and third component substrates being  
4 disposed in the first and second openings, respectively, the first through-hole being  
5 disposed in the second component substrate and the second through-hole being disposed in  
6 the third component substrate.

1 30. An assembly comprising:  
2 a substrate having first and second substantially parallel outer surfaces, and first and second  
3 through-holes that each extend from the first outer surface to the second outer

4 surface;  
5 a plurality of conductive traces formed on the substrate; and  
6 a first cable extending out of the first through-hole, adjacent the second outer surface of the  
7 substrate, and into the second through-hole, the first cable including a first electronic  
8 conductor having first and second flat ends.

1 31. The assembly of claim 30 wherein the first and second flat ends of the first electronic  
2 conductor are disposed within the first and second through-holes, respectively.

1 32. The assembly of claim 30 wherein the first and second flat ends of the first electronic  
2 conductor are substantially coplanar with the first surface of the substrate.

1 33. The assembly of claim 30 wherein the first cable further comprises a second conductor  
2 having first and second flat ends disposed within the first and second through-holes.

1 34. The assembly of claim 30 wherein the first cable further comprises a conductive shield  
2 extending along the length of the cable and disposed about the first electronic conductor.

1 35. The assembly of claim 30 wherein the first cable comprises an insulating material  
2 extending along the length of the cable and disposed about the first electronic conductor.

1 36. The assembly of claim 35 wherein a terminal portion of the first electronic conductor  
2 extends beyond the insulating material and terminates at the first flat end, the terminal  
3 portion being disposed to enable deflection of the first flat end in response to a contact  
4 force applied to the first flat end.

1 37. The assembly of claim 35 wherein a terminal portion of the first electronic conductor  
2 extends beyond the insulating material and terminates at the first flat end, the terminal  
3 portion including at least one bend to enable deflection of the first flat end in response to a  
4 contact force applied to the first flat end.

1 38. The assembly of claim 37 wherein the first electronic conductor is formed from a resilient  
2 material such that, when deflected in response to the contact force, the first flat end of the  
3 first electronic conductor is urged in a direction opposite the direction of the contact force.

1 39. The assembly of claim 37 further comprising a conductive plating on the surface of the  
2 terminal portion of the first electronic conductor, the terminal portion of the first electronic  
3 conductor and conductive plating having a higher modulus of elasticity than the terminal  
4 portion of the first electronic conductor alone.

1 40. The assembly of claim 37 wherein the terminal portion includes two bends having  
2 substantially equal bend angles, the two bends including the at least one bend.

1 41. The assembly of claim 37 wherein the terminal portion includes three bends, including the  
2 at least one bend, and wherein the flat end of the first electronic conductor is disposed  
3 substantially axially aligned with an insulated portion of the first electronic conductor.

1 42. The assembly of claim 30 further comprising:  
2 a first printed circuit board;  
3 a first integrated circuit device affixed to the first printed circuit board; and  
4 a first connector affixed to the first printed circuit board and removably connected to the

5           substrate, the first connector including a conductive contact electrically coupled to the  
6           first integrated circuit device and disposed in contact with the first flat end of the first  
7           electronic conductor.

1    43.   The assembly of claim 42 further comprising:  
2           a second printed circuit board;  
3           a second integrated circuit device affixed to the second printed circuit board; and  
4           a second connector affixed to the second printed circuit board and removably connected to  
5           the substrate, the second connector including a conductive contact electrically  
6           coupled to second integrated circuit device and disposed in contact with the second  
7           flat end of the first electronic conductor.

1    44.   The assembly of claim 42 wherein the first printed circuit board includes a first contact pad  
2           electrically coupled to the first integrated circuit device, a second contact pad electrically  
3           coupled to the conductive contact and a conductive trace extending from the first contact  
4           pad to the second contact pad.

1    45.   The assembly of claim 44 wherein the conductive contact is electrically coupled to the  
2           second contact pad via a second electronic cable disposed within the first connector.

1    46.   The assembly of claim 42 further comprising a second electronic cable extending from the  
2           first integrated circuit device to the first connector to establish electrical contact between  
3           the first integrated circuit device and the conductive contact.

1    47.   The assembly of claim 42 further comprising a second cable extending from the first  
2           integrated circuit device to the first connector, the second cable having a second electronic



3 conductor having a first end that constitutes the conductive contact.

1 48. The assembly of claim 47 wherein the second cable comprises an insulating material  
2 extending along the length of the cable and disposed about the second electronic conductor.

1 49. The assembly of claim 48 wherein a terminal portion of the second electronic conductor  
2 extends beyond the insulating material and terminates at the first end, the terminal portion  
3 including at least one bend to enable deflection of the first end in response to the contact  
4 with the first flat end of the first electronic conductor.

1 50. The assembly of claim 49 wherein the second electronic conductor is formed from a  
2 resilient material such that, when deflected in response to the contact with the first flat end  
3 of the first electronic conductor, the first end of the terminal portion is urged against the  
4 first flat end of the first electronic conductor.

1 51. The assembly of claim 49 further comprising a conductive plating on the surface of the  
2 terminal portion of the second electronic conductor, the terminal portion of the second  
3 electronic conductor and conductive plating having a higher modulus of elasticity than the  
4 terminal portion of the second electronic conductor alone.

1 52. The assembly of claim 30 wherein the substrate comprises a plurality of layers including a  
2 first layer having an interior surface disposed in contact with an interior surface of another  
3 of the layers, and wherein at least a portion of the plurality of conductive traces is formed  
4 on the interior surface of the first layer.

1 53. An assembly comprising:

2 a substrate having first and second substantially parallel outer surfaces, and a first  
3 conductive via that extends from the first outer surface to the second outer surface;  
4 a plurality of conductive traces formed on the substrate;  
5 a first integrated circuit device disposed on the first outer surface of the substrate, the  
6 integrated circuit device having a first contact electrically coupled to one of the  
7 plurality of conductive traces, and a second contact electrically coupled to the first  
8 conductive via; and  
9 a first cable extending out of the first conductive via and having a first electronic conductor  
10 electrically coupled to the first conductive via.

1 54. The assembly of claim 53 wherein the substrate comprises a plurality of layers including a  
2 first layer having an interior surface disposed in contact with an interior surface of another  
3 of the layers, and wherein at least a portion of the plurality of conductive traces is formed  
4 on the interior surface of the first layer.

1 55. The assembly of claim 53 wherein the substrate has a second conductive via that extends  
2 from the first outer surface to the second outer surface, and wherein the first integrated  
3 circuit device has a third contact electrically coupled to the second conductive via, the  
4 assembly further comprising a second cable extending out of the second conductive via and  
5 having a second electronic conductor electrically coupled to the second conductive via.

1 56. The assembly of claim 53 wherein the first conductive via is defined by a plated annular  
2 wall of the substrate, the plated annular wall including a first plated region that extends  
3 from the first outer surface to the second outer surface, and a second plated region that  
4 extends from the first outer surface to the second outer surface, the first and second plated

regions being electrically isolated from one another.

57. The assembly of claim 56 wherein the first electronic conductor is soldered to the first plated region and wherein the first cable further comprises a second electronic conductor soldered to the second plated region.

58. The assembly of claim 53 wherein the first electronic conductor is soldered to the first conductive region.

59. The assembly of claim 53 wherein the substrate has a second conductive via that extends from the first outer surface to the second outer surface, and wherein the first cable extends to the second conductive via and the first electronic conductor is electrically coupled to the second conductive via, the assembly further comprising a second integrated circuit device disposed on the first outer surface of the substrate, the second integrated circuit device having a first contact electrically coupled to one of the plurality of conductive traces, and a second contact electrically coupled to the second conductive via.

60. The assembly of claim 53 wherein the cable comprises a conductive shield disposed about the first electronic conductor and extending along the length of the first cable.

61. An assembly comprising:  
a first substrate having a plurality of through-holes therein;  
a second substrate having a plurality of through-holes therein; and  
a plurality of cables extending from the plurality of through-holes in the first substrate to the plurality of through-holes in the second substrate, each of the plurality of cables including a first conductor having a first exposed end disposed at a surface of the first

7            substrate to receive a first contact of a first removable connector and a second  
8            exposed end disposed at a surface of the second substrate to receive a first contact of  
9            a second removable connector.

1    62.    The assembly of claim 61 wherein each of the plurality of cables further includes a second  
2           conductor having a first exposed end disposed at the surface of the first substrate to receive  
3           a second contact of the first removable connector and a second exposed end disposed at the  
4           surface of the second substrate to receive a second contact of the second removable  
5           connector.

1    63.    The assembly of claim 61 wherein each of the plurality of cables comprises a conductive  
2           shield disposed about the first conductor.

1    64.    The assembly of claim 61 further comprising a third substrate having a substantially planar  
2           first surface and first and second openings in the first surface, and wherein the first and  
3           second substrates are disposed in the first and second openings, respectively, such that the  
4           surfaces of the first and second substrate are substantially coplanar.

1    65.    The assembly of claim 64 wherein the first and second substrates are disposed in the first  
2           and second openings, respectively, such that the surfaces of the first and second substrates  
3           are substantially coplanar with the first surface of the third substrate.

1    66.    The assembly of claim 64 wherein the first substrates is secured within the first opening by  
2           a retaining member.

1    67.    The assembly of claim 64 wherein the first substrate is moveably secured to the third

2           substrate to enable movement of the first substrate within the first opening.

1   68.   The assembly of claim 67 wherein the first substrate is pivotably secured to the third  
2           substrate to enable rotation of the first substrate within the first opening.

1   69.   The assembly of claim 64 wherein the third substrate comprises a plurality of conductive  
2           traces disposed thereon.

1   70.   The assembly of claim 69 wherein the third substrate comprises a plurality of layers  
2           including a first layer having an interior surface disposed in contact with an interior surface  
3           of another of the layers, and wherein at least a portion of the plurality of conductive traces  
4           are disposed on the interior surface of the first layer.

1   71.   An assembly comprising:  
2           a first substrate having a first and second openings;  
3           a second substrate disposed in the first opening and having a plurality of through-holes;  
4           a third substrate disposed in the second opening and having a plurality of through-holes;  
5           and  
6           a plurality of cables extending from the plurality of through-holes in the second substrate to  
7           the plurality of through-holes in the third substrate, each of the plurality of cables  
8           including a first conductor having a first exposed end disposed at a surface of the  
9           second substrate and a second exposed end disposed at a surface of the third  
10          substrate.

1   72.   The assembly of claim 71 wherein the second substrate is moveably coupled to the first  
2           substrate.

1 73. The assembly of claim 71 further comprising a first circuit board assembly having a  
2 connector that includes a first plurality of contacts each disposed in contact with the first  
3 exposed end of the first conductor included in a respective one of the plurality of cables.

1 74. The assembly of claim 73 further comprising a second circuit board assembly having a  
2 connector that includes a first plurality of contacts each disposed in contact with the second  
3 exposed end of the first conductor of a respective one of the plurality of cables.

1 75. The assembly of claim 73 wherein the connector further includes a supply voltage contact  
2 coupled to a supply voltage conductor disposed on the first substrate.

1 76. The assembly of claim 75 wherein the first substrate comprises a plurality of layers  
2 including a first layer having an interior surface disposed in contact with an interior surface  
3 of another of the layers, and wherein the supply voltage conductor is printed on the interior  
4 surface of the first layer.

1 77. The assembly of claim 73 wherein each of the plurality of cables includes a second  
2 conductor having a first exposed end disposed at a surface of the second substrate and a  
3 second exposed end disposed at a surface of the third substrate.

1 78. The assembly of claim 77 wherein the connector further includes a second plurality of  
2 contacts each disposed in contact with the first exposed end of the second conductor  
3 included in a respective one of the plurality of cables.

1 79. The assembly of claim 73 wherein the first circuit board assembly comprises:

2 a first integrated circuit device; and  
3 a cable coupled between the first integrated circuit device and the connector.

1 80. The assembly of claim 71 further comprising a dielectric material disposed over the  
2 exposed ends of the first conductors of the plurality of cables.

1 81. The assembly of claim 80 further comprising a first circuit board assembly having a  
2 connector that includes a first plurality of contacts, each of the contacts being spaced apart  
3 from an exposed end of a respective one of the first conductors by the dielectric material.

1 82. An connector comprising:  
2 a housing having a first surface and a second surface; and  
3 a first cable extending through the housing, the first cable including a first conductor and  
4 an insulating material disposed about the first conductor, the first conductor including  
5 a terminal portion that extends beyond the insulating material and terminates at a first  
6 end, the terminal portion including at least one bend to enable deflection of the first  
7 end in response to a contact force applied to the first end.

1 83. The connector of claim 82 wherein the first conductor is formed from a resilient material  
2 such that, when deflected in response to the contact force, the first end of the first  
3 conductor is urged in a direction opposite the direction of the contact force.